
Faces of Science: Harshini Mukundan

March 20, 2015



Leaving her mark on infectious disease

Harshini Mukundan is a scientist and team leader at the Los Alamos National Laboratory, working on the development of diagnostic and surveillance strategies for emerging infectious diseases and drug-resistant organisms.

Describing her passion for infectious disease research, she says, "Every small incident in your life leaves its mark on you, and that mark influences your decisions in every phase of life. Growing up in a country with a very high incidence of communicable diseases has certainly left its mark on me."

Mukundan was born in Chennai, a busy city in Southern India, to a moderately affluent family with good access to medical care. Despite that, she suffered from mumps as a child, and knew children that suffered from other infectious diseases that could have easily been prevented by vaccination. She clearly remembers her family's gardener

coughing persistently as he worked. She did not know then that he was suffering from pulmonary tuberculosis.

Mukundan also remembers use of antibiotics without prescription control, one of the many reasons for the upsurge of drug-resistant organisms today. Fighting antimicrobial drug resistance both in the laboratory and at the community level is one of her driving forces.



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Frontiers in Science - The Microbe Strikes Back

Effective diagnosis can save lives and prevent its spread. In the Los Alamos National Laboratory's [Frontiers in Science lecture series](#), Mukundan's talk will cover how our immune system discriminates between itself and foreign entities and how a new laboratory and nature-inspired strategy can detect tuberculosis equally well in human and animal populations (see poster below). The approach is being extended to other applications such as the identification of strep throat and respiratory infections.

"The unnecessary and uncontrolled use of antibiotics in animals to prevent, control and treat disease and for promoting growth, are only some of the reasons for the rapid increase in antibiotic resistance today," said Mukundan. "To prevent the world from entering a post-antibiotic era in the very near future, where even common infections can prove life threatening, urgent and immediate change is mandatory...The choices we make and the responsibility we show can slow down the emergence of antibiotic resistance and ensure the viability of these miracle drugs for future generations."

As a child she was interested in the performing arts and was not passionate about the science. However her masters program changed her outlook. She worked in a research institution on real world problems that were challenging, inspiring, and exciting.

When she came to New Mexico, in 1998, to pursue her PhD in Biomedical Sciences from the University of New Mexico, she found she enjoyed the open and questioning culture, the casual approach to teaching, and the helpful nature of her professors and teachers. Her graduate work was entirely different from what she had done so far, and she was introduced to human physiology.

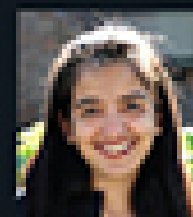
After two years working at QTL Biosystems Ltd in Santa Fe, New Mexico, as a staff scientist, developing hand-held sensors for detection of biowarfare agents, she decided to join Los Alamos National Laboratory as a post-doctoral fellow. Her childhood experiences motivated her to obtain a NIH post-doctoral fellowship to study tuberculosis and develop methods for its effective diagnosis.



Frontiers in Science

Public Lecture Series

Sponsored by the Fellows of Los Alamos National Laboratory



Harshini Mukundan
Physical Chemistry
and Applied Spectroscopy

The Microbe Strikes Back: The Return of Tuberculosis

Tuesday, March 24, 2015 at 7 p.m.

Duane W. Smith Auditorium
Los Alamos High School, Los Alamos

Friday, April 3, 2015 at 7 p.m.

James A. Little Theater
New Mexico School for the Deaf
1000 Cerrillos Road, Santa Fe, NM

Monday, April 6, 2015 at 7 p.m.

New Mexico Museum of Natural History
and Science, 2001 Mountain Road NW
Albuquerque, NM

Human evolution and persistent diseases have existed side-by-side. A recent concern is the re-emergence of tuberculosis, one of the oldest and most challenging diseases known to man. Effective diagnosis can save lives and prevent its spread. This talk will cover how our immune system discriminates between itself and foreign entities and how a new laboratory and nature-inspired strategy can detect tuberculosis equally well in human and animal populations. The approach is being extended to other applications such as the identification of strep throat and respiratory infections.



**Admission is free!
Bring a friend!**

For more information, call (505) 666-9166 or (505) 667-7000
or go to <https://frontiers.lanl.gov>

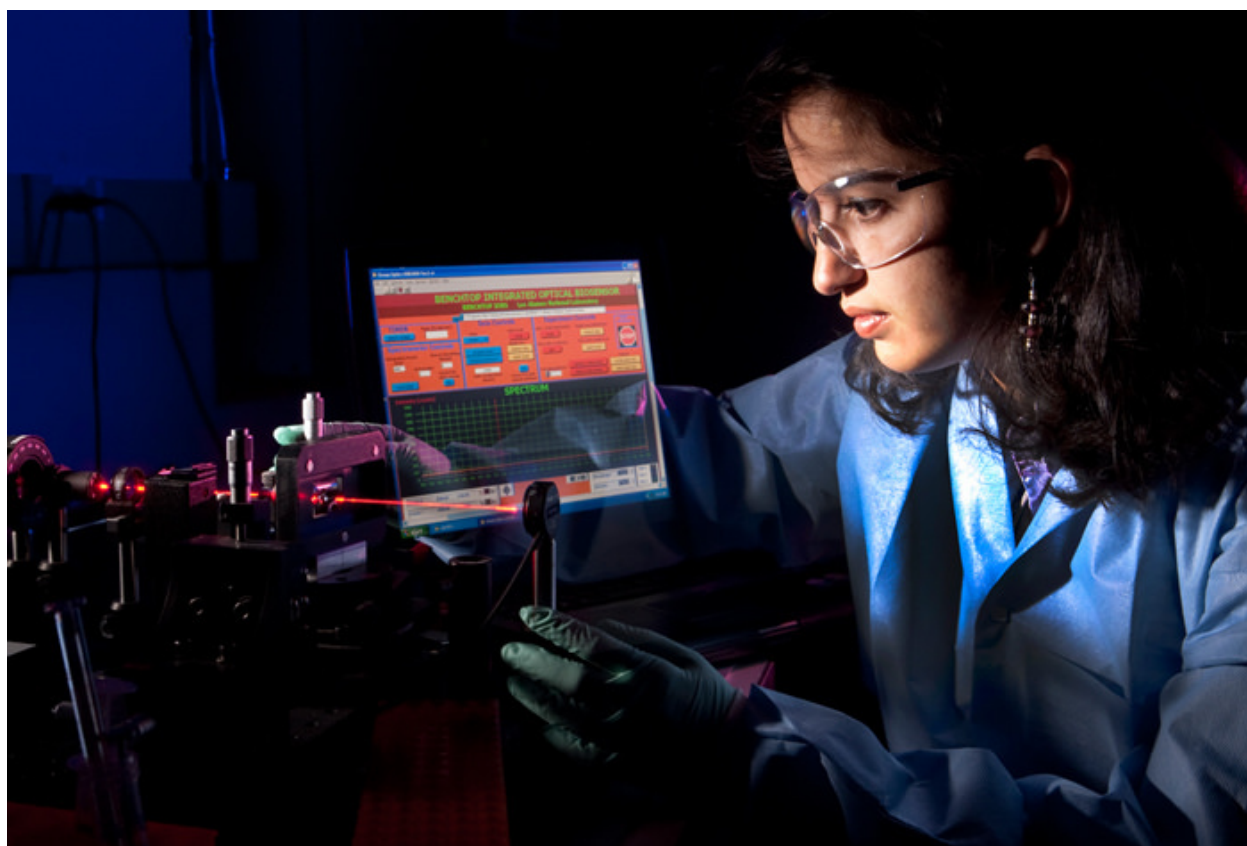


[Mukundan presents at the Frontiers in Science lecture series: "The Microbe Strikes Back: The Return of Tuberculosis" in March and April of 2015](#)

Together with her mentor Basil Swanson, she has been working on the development of assays for the diagnosis of tuberculosis, traveling to endemic populations, meeting and working with people in the field. Pursuing unusual findings and atypical results have resulted in new approaches that may allow for the detection of biomarkers associated with bacterial diseases directly in the infected patients, and she and her group are currently working on the clinical evaluation of these assays in human trials.

Traveling to high disease burden populations in many areas of the world has been an eye-opening experience, teaching Mukundan how fortunate she is to live in a developed economy like the United States.

Her ultimate goal is to develop better diagnostics for infectious disease, especially ones that have developed resistance to antibiotics, and to develop a global awareness for increasing drug-resistance.



More about her career and research

In 2006, she joined LANL with a prestigious NIH post-doctoral Fellowship to develop diagnostic assays for tuberculosis. Since then, she has led and participated in projects aimed at developing rapid detection and diagnostics assays for breast cancer, influenza, toxic panels, and others.

Currently, her research is focused on developing rapid pathogen biomarker-based assays for the detection of active tuberculosis in a complex endemic background, development of assays for shiga-toxin carrying *E. coli* in beef, and biomarker-based detection of multiple pathogens in the same host. Her research spans the development

of assays, functional surfaces and ligands, and understanding host-pathogen biology and pathogen evolution.

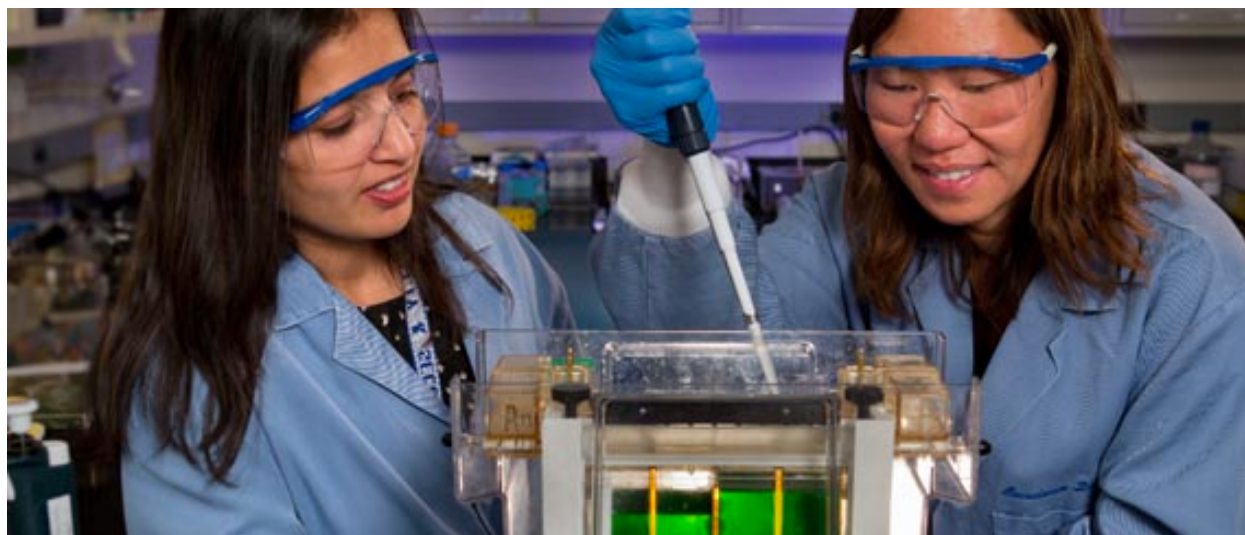
Her work in bovine tuberculosis detection, which has grown to include ranchers and veterinarians throughout New Mexico, began in 2009. Mukundan and her team use clinical studies to evaluate the use of biomarkers and antibodies to develop a reliable diagnostic assay for bovine TB.

“The assay will not only be able to detect active infection, but also discriminate it from contamination with other bacteria that don't cause disease,” said Mukundan.

She also is helping a Los Alamos medical technology company explore better diagnostics for traumatic brain injury. With the increased incidence of traumatic brain injury among soldiers in combat the condition has become one of significant concern for the U.S. Department of Defense.

Mukundan received a Principal Investigator Excellence (PIE) Award from the New Mexico Small Business Assistance program (NMSBA) for assisting several New Mexico small businesses. NMSBA recognized Mukundan for the assistance she provided to small businesses on two separate projects: bovine tuberculosis detection and better diagnostics for traumatic brain injury.

In addition to her research, she excels in scientific and community outreach activities and mentoring. She speaks with great enthusiasm in such venues as Café Scientifique for high school students and for the Lab's Frontiers in Science series. Above all, Mukundan enjoys mentoring students and post-doctoral fellows, and watching a new era of rising inspired scientists.



Harshini Mukundan (left) watches as fellow Los Alamos bioscientist Elizabeth Hong-Geller loads a vertical electrophoresis gel, used to separate proteins and small molecules. This technique is useful for developing improved methods to detect pathogens.

Additional links

- [Harshini Mukundan bio page: Chemistry Division](#)
- [Frontiers in Science talks to explore new strategies for diagnosing challenging diseases](#)
- [Advancing the art of tuberculosis detection](#)

- [USDA awards \\$1 million for E. coli research by LANL and New Mexico Consortium](#)

Mukundan works for C-PCS's Physical Chemistry and Applied Spectroscopy group.

Los Alamos National Laboratory

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